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PREPARE BRIEF REQUEST FOR REVIEW

Docket Number (Optional)

017447-0170

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Signature

Typed or printed name

Application Number

09/720,730

Filed

12/29/2000

First Named Inventor

Koichi WATANABE

Art Unit

1742

Examiner

Sikyin IP

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.

I am the

☐ applicant/inventor.☐ assignee of record of the entire interest.

See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☒ attorney or agent of record.

Registration number 25,479/43,438

☐ attorney or agent acting under 37 CFR 1.34.

Registration number if acting under 37 CFR 1.34

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NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.



*Total of 1 forms are submitted.

This collection of information is required by 35 U.S.C. 132. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Koichi WATANABE et al.
Title: SPUTTERING TARGET
Appl. No.: 09/720,730
Filing Date: 12/29/2000
Examiner: Sikyin IP
Art Unit: 1742
Confirmation Number: 3938

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Pre-Appeal Brief Request is being filed together with a Notice of Appeal.

Rejections Under 35 U.S.C. § 112

Claims 1, 3 and 5-9 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement, on the ground that: "The expressions 'at least some Ta' and 'at least some oxygen' in claim 1 do not have literal support from the specification as originally filed." (Final Rejection, p. 2)

The test for written description support is not "literal" disclosure in the specification, but whether one of ordinary skill in the art would recognize the inventor to be in possession of the invention as claimed. In the present record, it is uncontroverted that Ta and oxygen are inevitable impurities in a Nb sputtering target, and thus one of ordinary skill in the art would understand that the high purity Nb sputtering target of claim 1 necessarily and inherently contains at least some Ta and at least some oxygen. As noted in the Wantanabe Rule 132 Declaration of record, JP 62-103335 demonstrates that oxygen exists as an impurity in Nb,

even for super high purity Nb produced by high quality manufacturing methods. Moreover, all the examples disclosed in the present application for the oxygen effect study (see Table 3 on page 25) exhibit at least some oxygen.

The artisan would also recognize that Ta is an inevitable impurity based on the close connection between Ta and oxygen, i.e., the coexistence of Ta and oxygen in a high purity Nb sputtering target. For example, in the specification from page 4, line 25 to page 5, line 19, it is disclosed that oxygen as an impurity is closely related with an oxide of Ta (Ta_2O_5). Thus, one of ordinary skill in the art understands that the original specification inherently describes compositions containing “at least some Ta” and “at least some oxygen”.

Claims 1, 3 and 5-9 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite “because the wording ‘some’ in lines 3 and 4 fails to define [a] specific amount.”

The term “some” in lines 3 and 4 of claim 1, is definite in that the term merely conveys the existence of an amount greater than zero. The claims also express an upper limit for both impurities. Such a range is not indefinite.

Rejections Under 35 U.S.C. § 103

Claims 1, 3, 5-10, 12, 14-18 and 20-23 stand rejected as unpatentable (§ 103(a)) over Ohhashi in view of applicants' alleged admission; and claims 24-25 stand rejected as being unpatentable (§ 103(a)) over Ohhashi in view of acknowledged prior art on page 2, lines 1-24 (hereafter “the APA”).

Claims 1 and 18

Claim 1 recites an amount of Ta less than 3000 ppm, a Ta content dispersion within 30%, an amount of oxygen less than 200 ppm, and an oxygen content dispersion within 80%. Claim 18 recites an amount of oxygen less than 200 ppm and an oxygen content dispersion within 80%.

Ohhashi does not deal with the existence of Ta or oxygen in a Nb target, nor does Ohhashi recognize the problems caused thereby, much less the specific amounts and dispersion characteristics recited in claims 1 and 18. In the Ohhashi disclosure, Nb is merely enumerated as one of various metal materials for sputtering targets. Ohhashi does not disclose any specific examples relating to a Nb target, instead, Ohhashi discloses a high purity tungsten sputtering target (example 5) and a high purity titanium sputtering target (example 6). Ohhashi, which merely provides specific examples of W or Ti sputtering targets, does not

recognize the above problem in a Nb sputtering target, and accordingly cannot and does not suggest any specific amounts or dispersion of Ta or oxygen in a Nb sputtering target.

Moreover, Ohhashi's general disclosure of a uniform microstructure for the grains of his sputtering target with little diffusion for the atoms of the grains does not suggest specifically what the amount or dispersion may be for Ta or oxygen impurities in a Nb sputtering target. Moreover, a uniform dispersion merely means that the dispersion is constant, not that the dispersion is zero.

The PTO has not met its burden of showing that the amount and dispersion levels of the inevitable impurities Ta and oxygen recited in claims 1 and 18 are necessarily present in the Nb sputtering target disclosed in Ohhashi. To the contrary, Appellants have shown that the Ta and oxygen amounts and dispersion recited in claims 1 and 18 are not inherent in all Nb sputtering targets. As evidence, examples from the present specification disclose some Nb sputtering targets having Ta and oxygen with amounts and dispersion outside the range recited in claim 1 and 18.

Moreover, the PTO has provided no evidence that the distribution of the inevitable impurities Ta and oxygen in a Nb sputtering target would be uniform, such that the dispersion % of these impurities is zero. To the contrary, the many examples of non-zero dispersion % in the present specification clearly demonstrates that a zero dispersion % of oxygen and Ta in Nb sputtering targets is not inherent. Merely because an element is an impurity does not suggest that it has a uniform distribution.

The burden is upon the PTO to reasonably establish inherency, which has not been done. To the extent that the PTO's mere arguments can *arguendo* be considered to have raised a reasonable case of inherency in Ohhashi of a uniform dispersion of these impurities, Appellants have shown by evidence that the amount and dispersion levels of Ta and oxygen claimed are not inherent in all Nb sputtering targets. Further, the PTO has provided no evidence or scientific basis to disqualify the objective evidence that Appellants are relying upon.

The Ta and oxygen amounts and dispersion recited in claims 1 and 18 are furthermore not obvious in view of Ohhashi, since Ohhashi does not suggest that the Ta and oxygen amounts and dispersion are result effective variables for a Nb sputtering target. A particular parameter must first be recognized as a result-effective variable in order to show that a

claimed range would have been obvious. See MPEP 2144.05 II B. In the present case, Ohhashi does not even discuss the existence of inevitable Ta or oxygen impurities in a Nb sputtering target, much less that such parameters are result effective variables.

Non-obviousness of claims 1 and 18 over Ohhashi is further supported by the advantages of the invention. Ohhashi fails to suggest these advantages, or to even recognize the parameters that are important in attaining these advantages. The inventors have determined important parameters in solving resistivity problems of Nb liner films for Al films, i.e., merely decreasing the Ta or oxygen content alone does not decrease the resistivity of the entire Nb film with reproducibility. The inventors have found that, in high purity sputtering targets, the dispersion and content of Ta in the Nb target, and the dispersion and content of oxygen in the Nb target, are important claimed parameters for decreasing the resistivity of the entire Nb wiring film, such as a film formed as a liner for an Al wiring film, when that film is formed using the sputtering target. This beneficial effect is demonstrated in the present specification. Ohhashi completely fails to recognize or teach this key relationship for a Nb sputtering target, and consequently the reference does not and cannot render the present invention "obvious".

Claim 10

Claim 10 recites an average grain diameter of 100 μ m or less, a grain diameter in the range of 0.5 to 5 times an average grain diameter, and a dispersion of the grain size ratio of adjacent grains within 30%. Ohhashi fails to disclose the average grain diameter, diameter range, or dispersion as recited in claim 10, or its advantages in suppressing giant dust particles, as recognized by the present inventors.

Ohhashi merely discloses a sputtering target having uniform microstructure and crystal orientations with crystal grain sizes of no more than 350 μ m. Ohhashi also fails to teach or suggest suppressing the occurrence of giant dust particles by controlling the grain size ratio of adjacent grains to be in the range of 0.5 to 5 and the dispersion of the grain size ratio of adjacent grains to be within 30%. Ohhashi does not recognize that the average grain size is important in reducing dust, nor does Ohhashi disclose the specific average grain size recited in claim 10.

Independent claim 1, as amended, recites "wherein each grain of Nb has a grain diameter in the range of 0.1 to 10 times an average grain diameter, and a grain size ratio of

adjacent grains is in the range of 0.1 to 10", and arguments regarding this feature in claim 10, apply equally to claim 1.

The alleged APA also fails to suggest the above-discussed parameters recited in claims 1, 10 and 18, and thus fails to cure the deficiencies of Ohhashi. Claims 1, 10 and 18 are submitted to be patentable over Ohhashi and the APA. Independent claims 24 and 25 include similar Ta and oxygen parameter limitations to claims 1 and 18, respectively, and are thus patentable for at least those reasons. All dependent claims depend from one of claims 1, 10, and 18, and are patentable for at least the same reasons.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Withdrawal of all rejections is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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By  _____

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